



Linking Ecosystem Services and Human Health: The Eco-Health Relationship Browser

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Benefits of Ecosystems

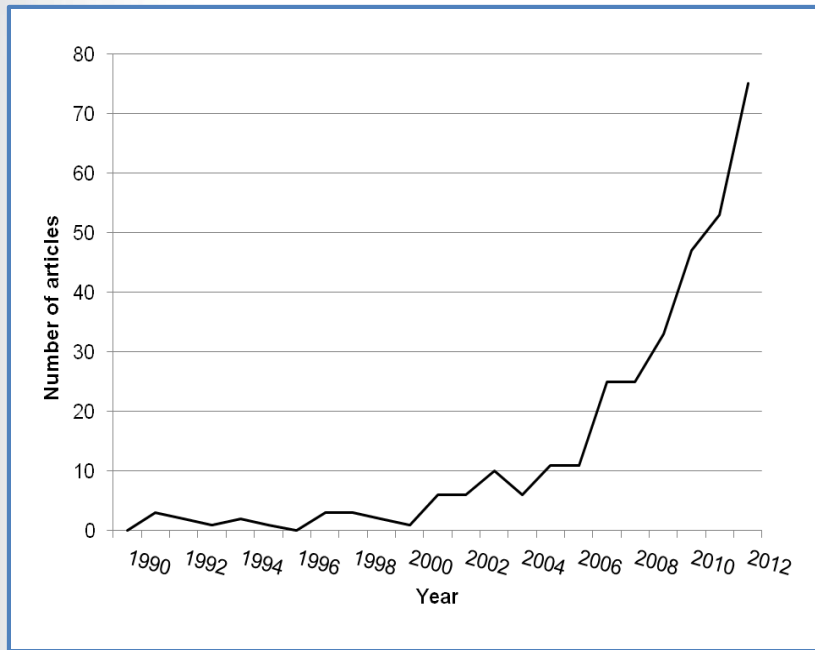
Buffering services

- Clean Air
- Clean Water
- Heat Hazard Mitigation
- Water Hazard Mitigation

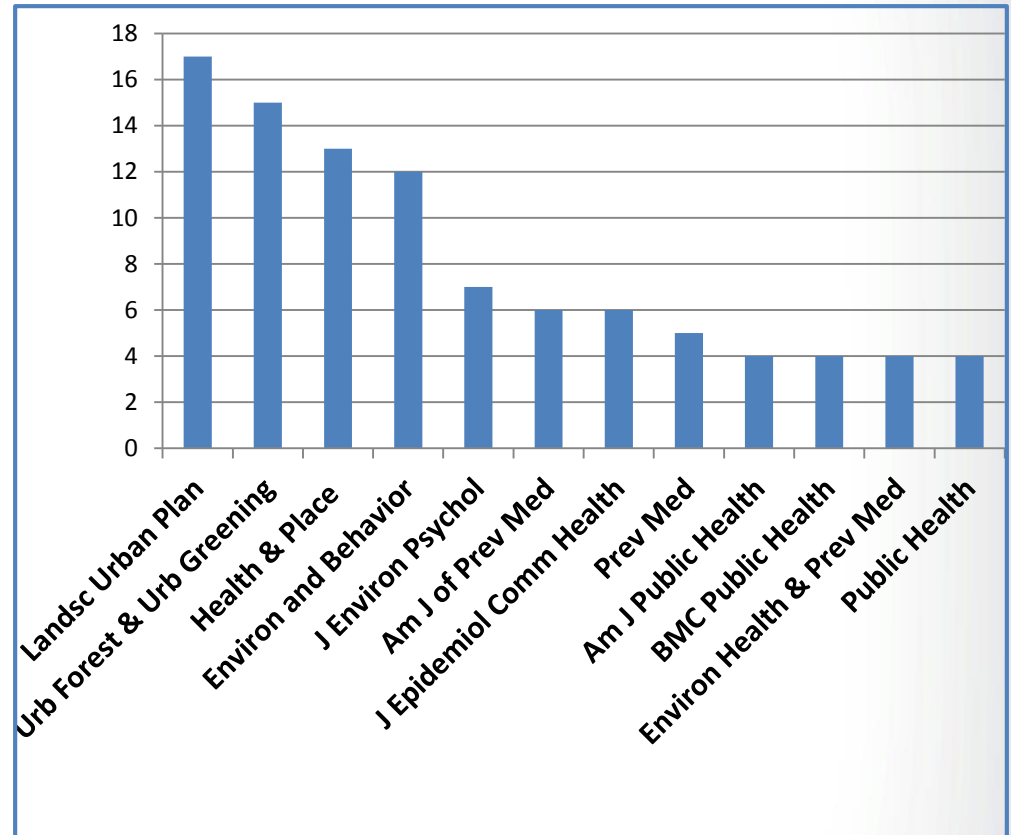
*Health promotional services **

- Aesthetics & Engagement with Nature
- Recreation & Physical Activity

Literature review on ecosystem services and human health (1990 – 2012)



Number of relevant articles found



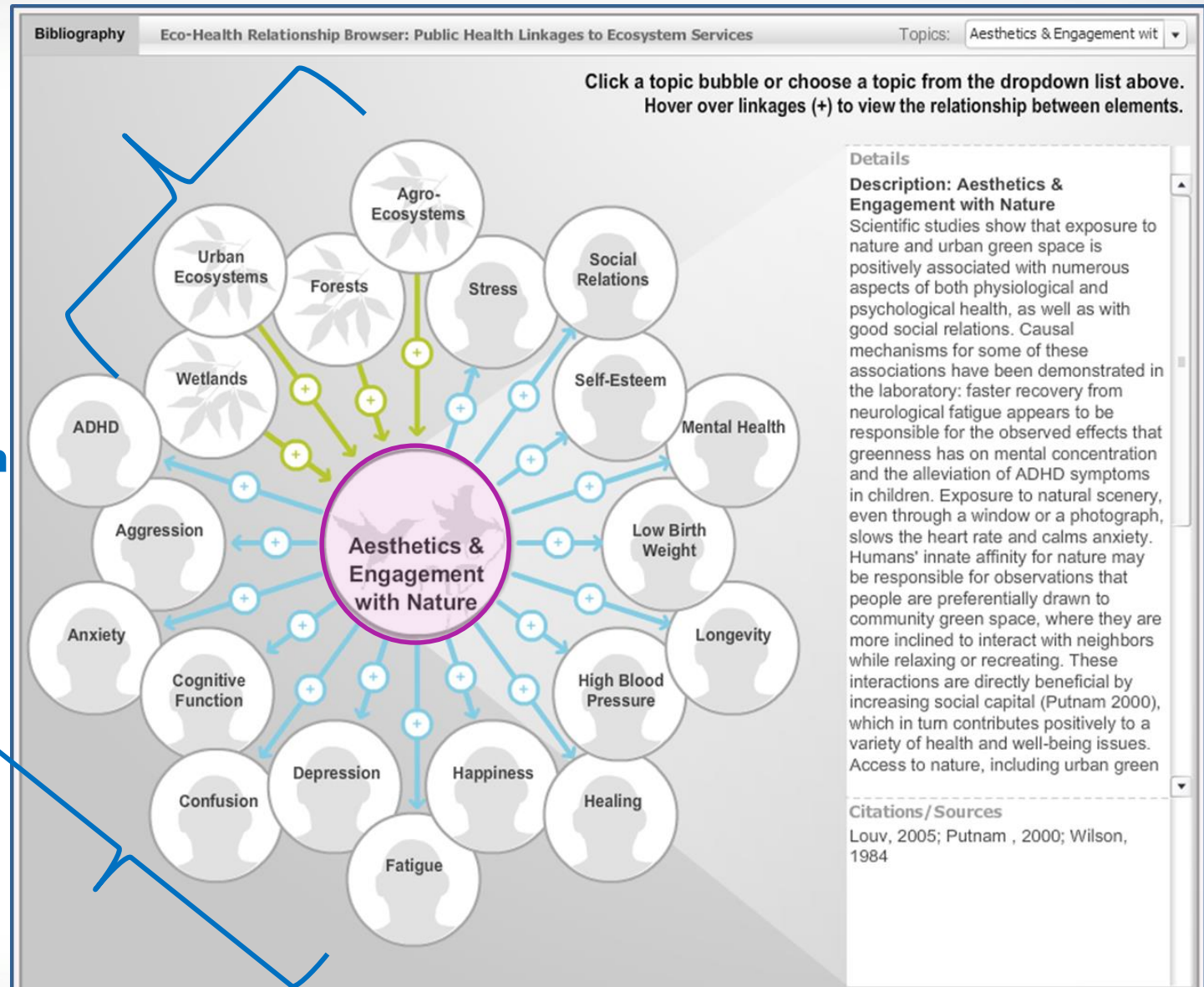
Journals publishing the most articles identified in review



Common Literature topics

- Air pollution filtration by trees
- Runoff and pollutant removal
- Urban green space and temperature
- Proximity to green space and physical activity
- Engagement with nature and effects on:
 - Wellbeing
 - Mood
 - Mental health
 - Social interactions, etc etc
- Window views and healing

Eco-Health Relationship Browser



Four
ecosystems

Six ecosystem
services

30 + health
outcomes

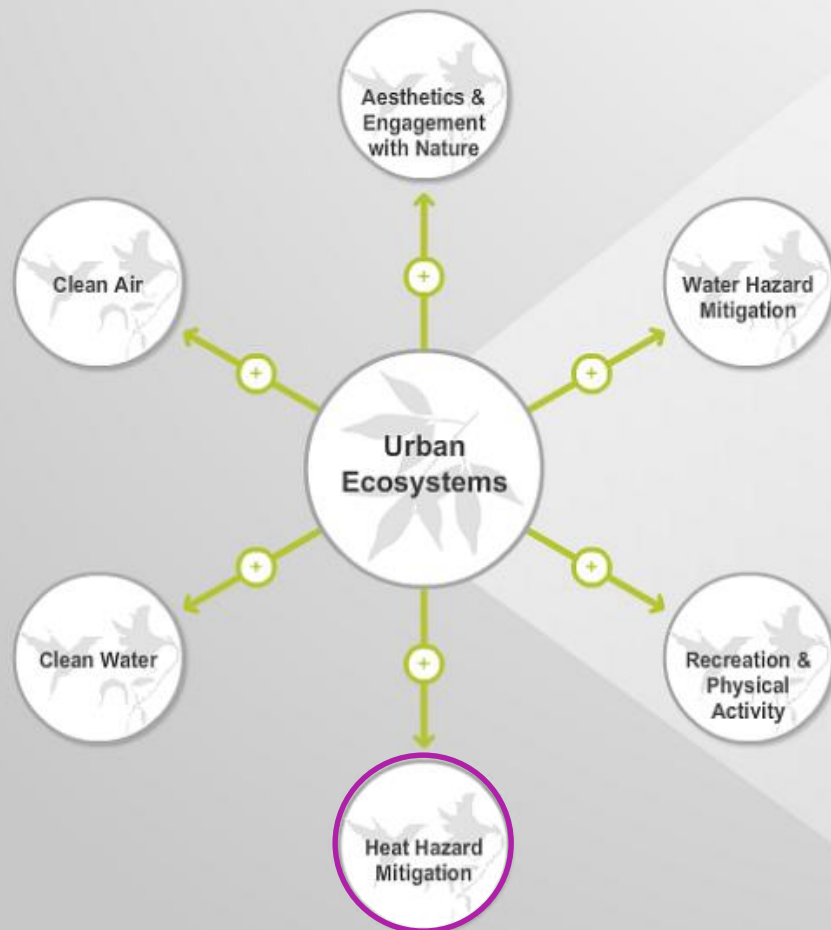
Asthma, ADHD, Cancers, Cardiovascular diseases, Heat stroke, Healing, Low birth weight, Obesity, Social Relations, Stress

Goals of Eco-Health Relationship Browser

- Increase awareness of nature's role in individual and community health and well-being
- Demonstrate value of green infrastructure through multiple benefits of “ecosystem services”
- Augment services in low SES and disproportionately stressed or vulnerable communities
- Prevent unintended consequences of habitat alteration and landscaping plans
- Promote systems thinking
- Provide documentation of scientific studies and strength of their results

http://enviroatlas.epa.gov/enviroatlas/tools/EcoHealth_RelationshipBrowser/introduction.html

Click a topic bubble or choose a topic from the
Hover over linkages (+) to view the relation



Details

Description: U

An urban ecosystem that contains natural elements and built infrastructure in large proportions and/or people. These systems include blue spaces within the area, such as parks, cemeteries, lakes and streams, along with human components. Urban ecosystems can mimic the function of natural ecosystems and thus provide their own important ecosystem services that contribute to human well-being in those urban areas. Various green environments such as shade trees, urban green spaces and urban forests, can exist within a single urban region. The services provided by urban ecosystems include filtering water runoff, providing areas for physical activity and recreation such as hunting and bird watching, and mitigating the Urban Heat Island effect by replacing heat-absorbing impervious surfaces and increased shading from shade trees. Additionally, urban green spaces such as private gardens provide opportunities for

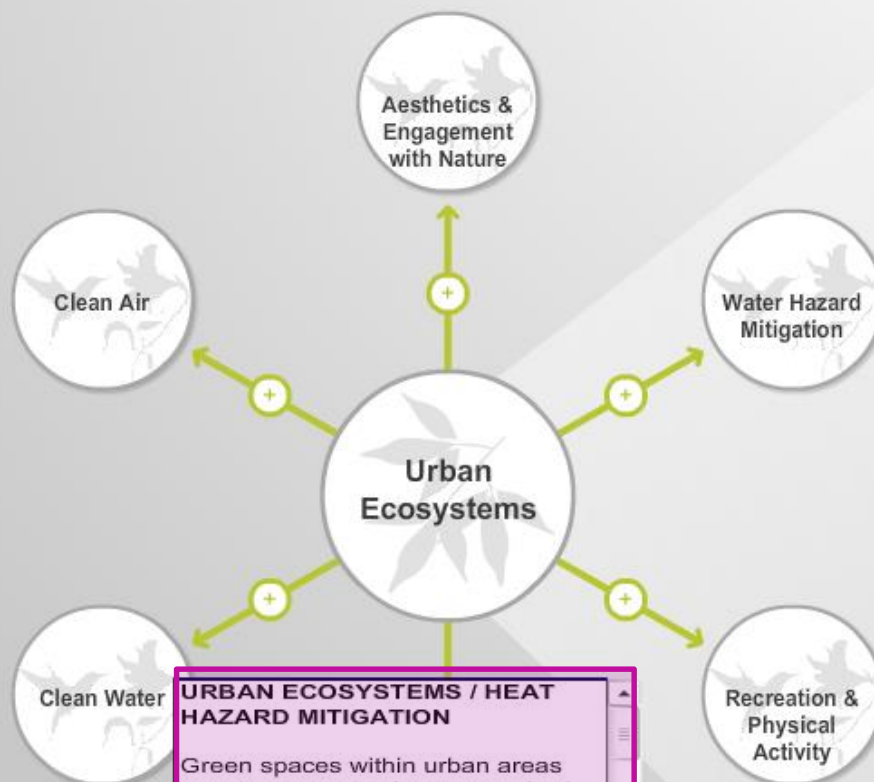
Citations/ Sources

Pickett et al., 2001; Guidotti, 2010; Hancock, 2002; Freeman et al., 2012

You are here: Urban Ecosystems

based on Montz Stefaner's Relation Browser

Click a topic bubble or choose a topic from the dropdown list above.
Hover over linkages (+) to view the relationship between elements.



URBAN ECOSYSTEMS / HEAT HAZARD MITIGATION

Green spaces within urban areas can decrease daytime atmospheric temperatures through shading and evapotranspiration, thus decreasing the Urban Heat Island effect (UHI). Increasing vegetative cover and adding higher reflective surface materials in urban areas can reduce temperatures within the area and

Details

Description: Urban Ecosystems

An urban ecosystem is a dynamic system that contains both built and natural elements. In urban ecosystems, built infrastructure typically covers a large proportion of the land surface and/or people live in high densities. These systems include all green and blue spaces within the area, such as parks, cemeteries, lakes and streams, along with human components. Urban ecosystems can mimic the function of natural ecosystems and thus provide their own important ecosystem services that contribute to human well-being in those urban areas. Various green environments such as shade trees, urban green spaces and urban forests, can exist within a single urban region. The services provided by urban ecosystems include filtering water runoff, providing areas for physical activity and recreation such as hunting and bird watching, and mitigating the Urban Heat Island effect by replacing heat-absorbing impervious surfaces and increased shading from shade trees. Additionally, urban green spaces such as private gardens provide opportunities for

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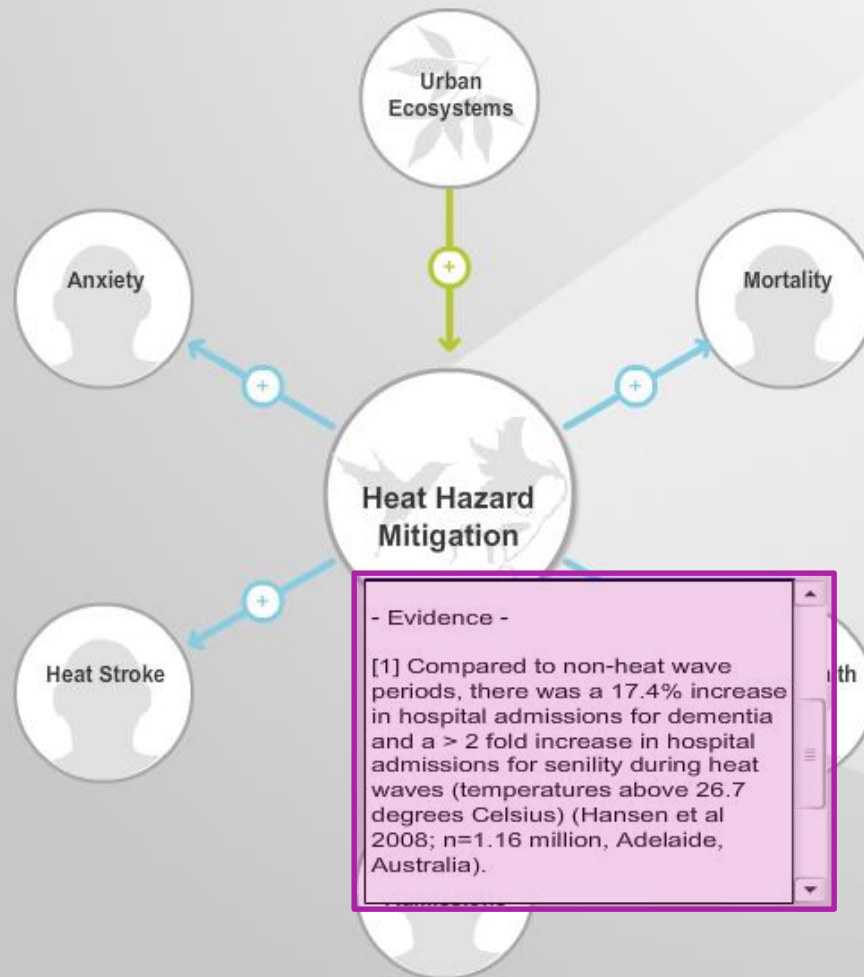
Details

Description: Heat Hazard Mitigation

The Urban Heat Island (UHI) effect is a heating phenomenon that occurs in urban centers and their surrounding suburban areas. With the UHI effect, metropolitan areas do not cool down at night due to the release of heat from dark surfaces that absorb heat throughout the day. In UHIs, temperatures can be 6 to 8 degrees higher in urban centers than in nearby woodlands. This fact is especially important during heat wave events, where those who reside in urban areas are often most effected due to exposure to higher maximum temperatures and less nighttime reprieve from heat. In urban systems, green spaces such as parks, urban forests and green roofs, can reduce urban temperatures and mitigate the effects of heat wave events through evapotranspiration and shading. The cooling effects of these green spaces may be especially important during heat waves, where temperatures directly outside the homes in which people are confined (elderly, infirm) have an effect on mortality.

You are here: [Urban Ecosystems](#) / [Heat Hazard Mitigation](#)

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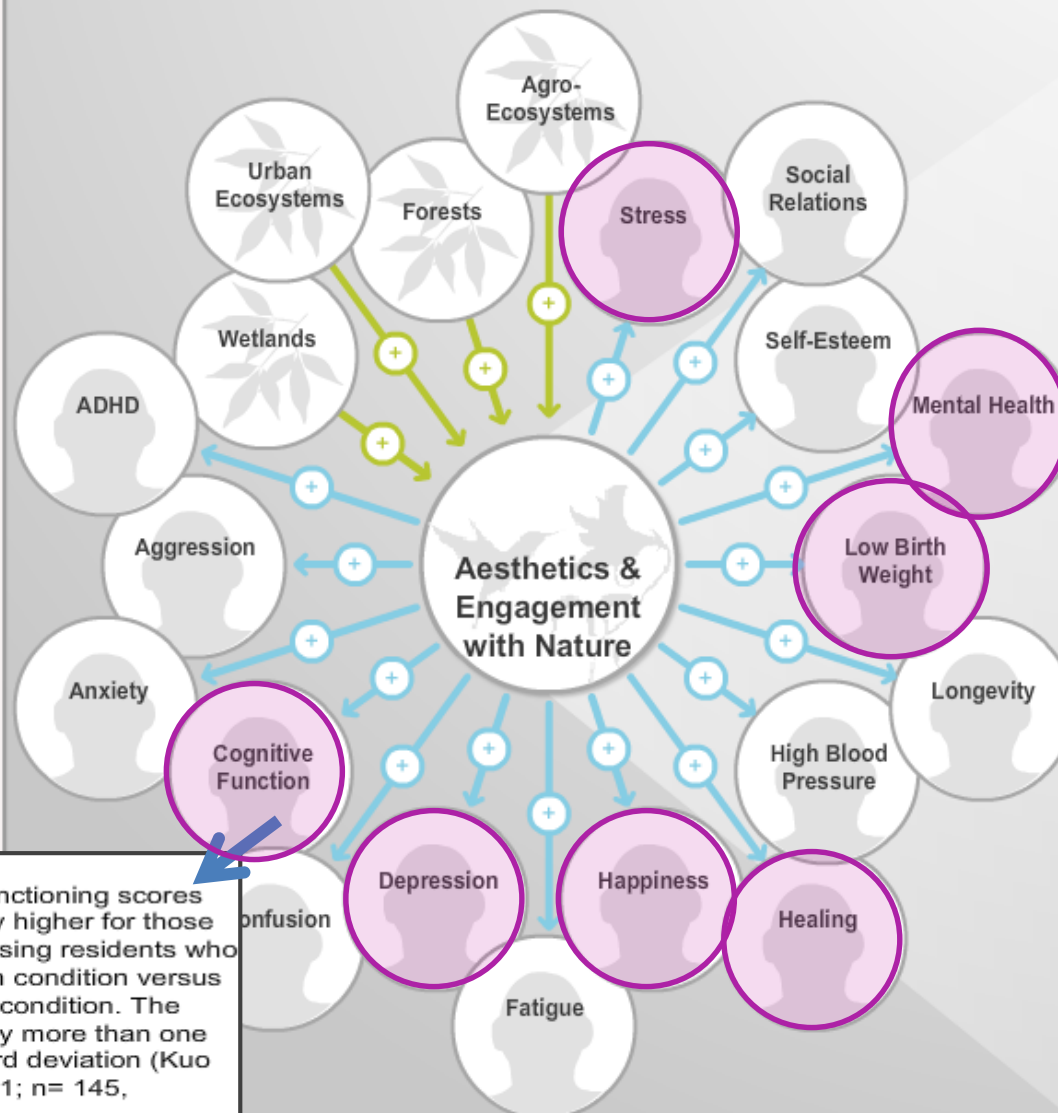


Details

Description: Clean Water

When a contaminant is introduced to water, it does not always remain suspended in the water but can be taken up by plants, animals, or soil before it reaches a major water body. Ecological features, whether natural or man-made, with the appropriate plant species and soil types, can remove up to 100% of certain contaminants from various landscapes including urban and agricultural areas. This process can reduce contamination of aquatic habitats, drinking-water supplies, and recreational waters. The absence of adequate natural water filtration due to habitat removal or the inability of the filtering environment to cope with the volume of pollution can lead to significant public-health threats. These threats can be reduced with water-treatment systems; however, this solution is not always an option due to expense or technology limitations.

Click a topic bubble or choose a topic from the dropdown list above.
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Details

Description: Aesthetics & Engagement with Nature

Scientific studies show that exposure to nature and urban green space is positively associated with numerous aspects of both physiological and psychological health, as well as with good social relations. Causal mechanisms for some of these associations have been demonstrated in the laboratory: faster recovery from neurological fatigue appears to be responsible for the observed effects that greenness has on mental concentration and the alleviation of ADHD symptoms in children. Exposure to natural scenery, even through a window or a photograph, slows the heart rate and calms anxiety. Humans' innate affinity for nature may be responsible for observations that people are preferentially drawn to community green space, where they are more inclined to interact with neighbors while relaxing or recreating. These interactions are directly beneficial by increasing social capital (Putnam 2000), which in turn contributes positively to a variety of health and well-being issues. Access to nature, including urban green

Citations / Sources

Louv, 2005; Putnam, 2000; Wilson, 1984

[1] Attentional functioning scores were significantly higher for those urban public housing residents who lived in the green condition versus the barren living condition. The scores differed by more than one third of a standard deviation (Kuo and Sullivan 2001; n= 145, Chicago).

[2] A view of nature from a high



Understanding the mechanisms

Mechanisms:

- The mechanisms behind hazard buffering services, and opportunities for physical activity are fairly well understood
- We are still unclear on the exact mechanisms, and potential interaction among mechanisms, behind engaging with nature
- We do not know which characteristics of natural settings are most important for triggering a beneficial interaction, and how these characteristics vary in importance among cultures, geographic regions and socio-economic groups.

Keniger, L. E., et al. 2013. What are the benefits of interacting with nature? Int J Environ Res Public Health.

How Does *Engagement with Nature* Affect Health?

Prevailing Mechanistic Theories

*

Stress Reduction

Ulrich 1993

Decreased cortisol and blood pressure

(Hartig et al. 2003; Lee et al. 2011; Park et al. 2008; Thompson Coon et al. 2011)

*

Attention Restoration

Kaplan and Kaplan 1989

Improved attention and cognitive function

(Hartig 2008; Kuo and Taylor 2004; Pretty et al. 2005; Taylor and Kuo 2009)

Nature Appreciation

Bratman et al. 2012

Improved mood and mental health

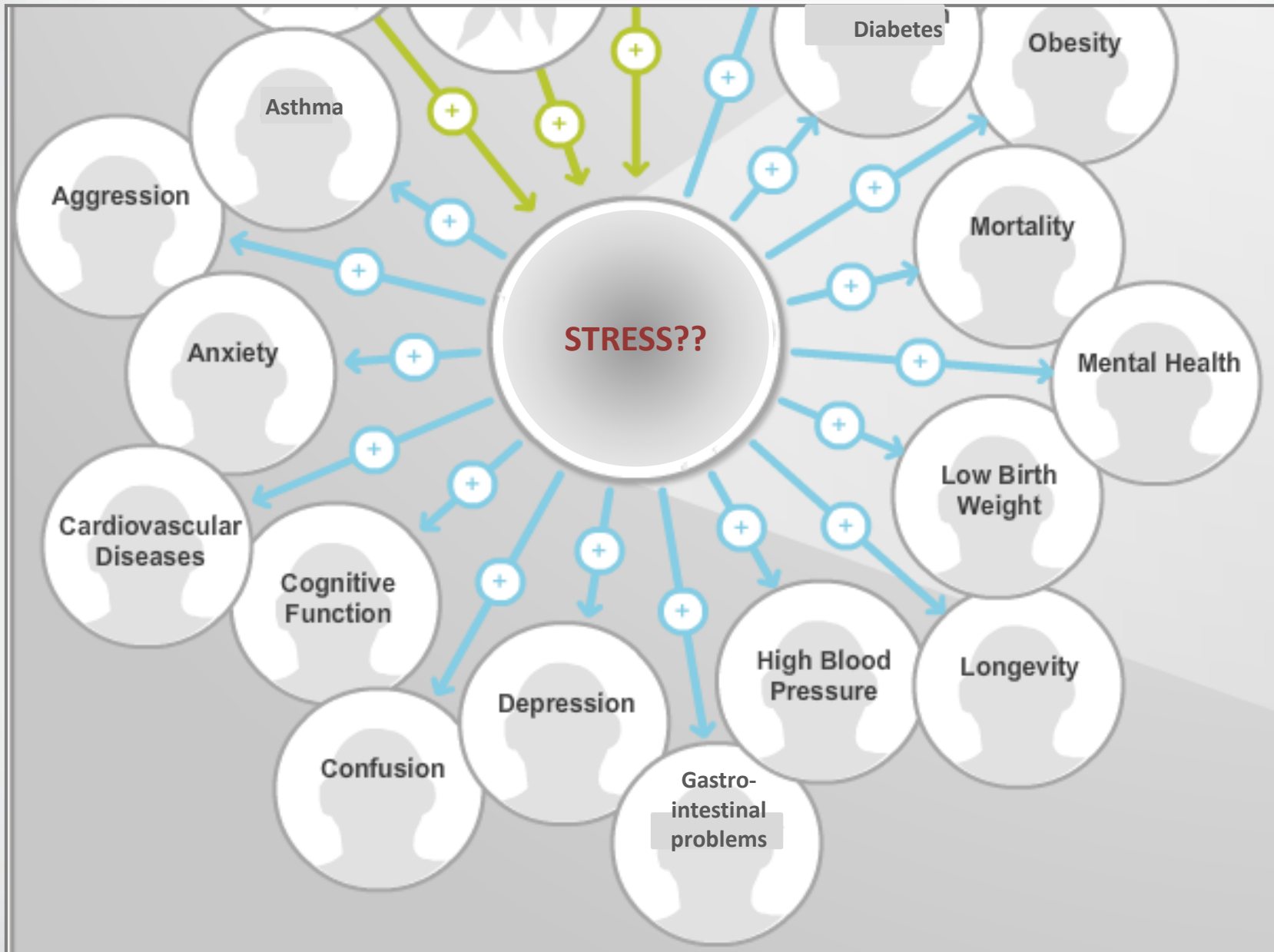
(Barton and Pretty 2010; van den Berg et al. 2010)

Social Interaction

Maas et al. 2008;
Barton and Pretty 2010

Increased social cohesion

(Coley et al. 1997; Kuo et al. 1998; Seeland et al. 2009)





Additional research needed

- Replicate published findings on eco-health associations
- Refine metrics, thresholds for eco exposures
- Meta-analyses
- Causation
- Mechanistic pathways



2013 & 2014 review of the literature

- 2013 review shows that there is still an increasing number of studies and reviews on this topic
 - Over 70 relevant original research or review articles
- Topics that are garnering interest:
 - Deserts
 - Proximity to coastal systems
 - Thermal comfort
- Overall evolution of the literature is changing from a focus on understanding the buffering capabilities of ecosystems to the health promotional aspects of these systems



Thank you

enviroatlas.epa.gov

***Access the Eco-Health Browser
from the right-hand side bar.***